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OBSERVATIONS

ILLUSTRATING THE

ANATOMICAL STRUCTURE AND PHYSIOLOGICAL HISTORY OF MONSTERS WITH EVENTRATION.

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IT is generally admitted by physiologists that investigations into the structural peculiarities of monsters by defect, redundancy, or excess, are replete with interest not only in a teratological but also in a physiological point of view; that the acquisition and careful comparison of the facts which are to be obtained from such investigations lead not only to the establishment of principles or laws appertaining to, and regulating the production of the various aberrations of nature, but also afford happy confirmation of the correctness of the views at present entertained respecting the development of the embryo.

To advance the science of teratology, and to determine its exact relations to natural science in general, it is necessary that every instance of malformation, whether slight or grave, should be accurately described even in its minutest details. The reason why teratology has not advanced so rapidly as many other branches of science is, as I shall have occasion to point out more fully hereafter, not from the want of materials, which are sufficiently abundant for every purpose, but from the want of accurate information on some points in the anatomy of monsters, which, although they may appear trivial and unworthy of notice to the casual observer, are nevertheless of the utmost importance for arriving at any satisfactory conclusions, or for deducing inferences respecting their nature and cause, which will bear the tests of time and observation. This remark appertains more especially to the numerous group of monsters with eventration which I intend to consider in this notice.

Three cases of monstrosity with eventration, for which I am in-

debtors to the kindness of Professors Simpson and Allen Thomson of this university, have come under my own observation, and have been dissected by me within the last two years. These cases, with others which have been carefully described and figured by recent observers, will enable me to point out the general features in the organization of these monsters, and to show the existing state of our knowledge of their history.

Case I. A full-grown male foetus, the head of which appeared perfectly formed, had a large membranous sac depending from the left side of the abdomen, in which the intestines, the liver, and other viscera were clearly discernible.

The sac, one of the most interesting structures connected with the organization of the monster, was entire, and enclosed the protruding viscera. It was firmly fixed by lymph to the liver and to the intestines, the convolutions of which it embraced closely. Its circumference, which encircled what might be appropriately termed the neck of the eventration, was attached to the abdominal parietes and to the umbilical cord. In most parts of its surface it was translucent and thin; but in others, especially over and in the immediate vicinity of the viscera, to which it was adherent, it was opaque, whitish, and had become much thickened, in consequence of a considerable amount of plastic lymph having been deposited within its substance. Careful dissection proved it to consist of three layers or membranes, superimposed on, yet distinct from each other, except where the lymph had been deposited, and had matted and united them into one firm and consistent mass. The external layer or membrane was continuous with the theca of the cord at the umbilicus, and, throughout the rest of its extent, with the common integument of the abdomen. It did not pass at once and abruptly into the skin, but a faint reddish-white line, about an eighth of an inch in breadth, indicated that the textures of the one and of the other were blended insensibly, and transmuted for a short distance. This layer was evidently the amnion. The second or middle layer was readily separated from the external around the circumference or neck of the sac, in consequence of the whole thickness of the abdominal parietes intervening between them. It passed behind and lined the walls of the abdominal cavity, and was thereby recognized as the parietal layer of the peritoneum. The internal layer, from its anatomical relations to the liver, stomach, and intestines, was discovered to be the visceral layer of the peritoneum, and to have been constituted principally of the greater omentum. It was most distinct at the lower part of the sac, and probably would not have entered into its formation had it not been intimately blended with the middle layer in many different places.

These membranes were each submitted to a microscopical ex-

amination, by which it was discovered that they had the same structure, that the external as well as the other two membranes possessed the germinal membrane and tessalate epithelium, characteristic of a serous membrane.

The sac having been divided crucially, and carefully reflected from the viscera, to which it was adherent, an aperture or rather a fissure in the abdominal parietes was brought into view. The inner side of this fissure was nearly straight, but the outer was curved; the convexity of the curve looking towards the left side. The fissure extended from the sternum to near the pubes; its length was nearly five inches; its breadth, even at the widest part, scarcely exceeded an inch.

All the abdominal viscera were displaced and thrown out, some partially, others completely—from the abdomen, and were all more or less misshapen.

The liver was thrown out of the abdominal cavity most completely. It rested on both the abdominal and thoracic parietes, and was placed obliquely on them, so that one surface looked upwards and to the right, the other downwards and to the left. It ascended as high as the lower border of the fourth rib, on the left side, and descended as far as the umbilicus on the right. Instead of having its usual flattened form, it had assumed that of a compressed sphere, in which the right and the left lobes could not be distinguished. There was a depression of inconsiderable extent on its right inferior border, through which the umbilical vein entered directly into its substance. Another depression was observed on the opposite border, which lodged the gall-bladder in a collapsed state. A large and rounded portion, thicker anteriorly than posteriorly, projected from its lateral and posterior aspect, which, on close examination, was found to be the *lobus spigelii*, enormously developed. A sulcus, more than an inch in depth, intervened between this lobe and the general mass of the organ.

The œsophagus was slightly increased in length, and opened into the stomach on the left side of the *lobus spigelii*. The stomach was greatly displaced, but not much altered in shape. It was received into the sulcus between, and was closely compressed by, the *lobus spigelii* and the body of the liver, in the substance of which it appeared to be completely imbedded, before some adhesions between the sac and that viscus were divided and the parts more completely exposed. The lesser curvature looked directly backwards, and tightly embraced the posterior constricted portion of the *lobus spigelii*. The greater curvature projected somewhat from the surface of the liver, and was all that could be seen of the stomach, unless the two parts of the liver were forcibly separated. The stomach appeared to have been lodged in the extraordinary and unlooked-for position I have just

described, by the *lobus spigelii* pushing both it and the gastro-hepatic omentum forwards and upwards, during an unusual increase in its size and development.

The intestines were drawn together and puckered, in a very peculiar manner, by thickening and extensive contraction of the mesentery and mesocolon—the result of inflammatory action. They were greatly distended with air and meconium. No appreciable difference in the structure and general appearance of the intestines could be detected throughout their whole extent. The existence of a short unsacculated cæcum, the position of a small and short *appendix vermiciformis*, together with a slight increase in the calibre of the gut, indicated the place of termination of the ilium, and the commencement of the colon. The cæcum and ascending colon were placed over but external to the left lumbar region. The rest of the gut was intermixed with the other viscera without any exact arrangement. The rectum was very much enlarged, and was distended with air; it passed through the fissure, coursed downwards through the pelvis on the right side of the bladder, and terminated at the anus, which was more anterior than usual. Numerous intussusceptions were observed especially in the jejunum and the ileum.

The spleen, much compressed and somewhat globular in form, was bound tightly to the cardiac extremity of the stomach, and placed in the front of the eventration. The hilus, properly so called, did not exist. Numerous large vessels ramified over its surface; many of these were collapsed, and these simulating depressions gave the organ a constricted or lobulated appearance.

The pancreas embraced the posterior surface of the constricted portion of the enlarged *lobus spigelii*. The splenic extremity was so much flattened out and expanded by the pressure of the liver on it, that it surpassed the duodenal extremity in breadth.

The left kidney had a somewhat pyramidal form, and rested on the abdominal parietes behind the intestinal canal and the spleen. The renal artery entered, and the renal vein and ureter emerged from its inferior and internal border. The right kidney had been only partially displaced, one part, the lower border, remaining in, and the other part, the superior border, projecting out of the abdominal cavity.

The left supra-renal capsule presented a constriction a little below its middle, which divided it into two unequal portions, the greater of which was above. The right supra-renal capsule was normal in every respect.

The right ureter passed into the pelvis in immediate contact with and on the right side of the aorta. The left descended into the pelvis parallel to the last turn of the intestine, which was situated behind the other viscera.

The testes still remained in relation with the kidneys on each side. The left was attached to some convolutions of the gut by adhesions contracted between these parts and the sac. The right was partially invested by a duplicature of the peritoneum. The *gubernaculum testis* could not be detected on either side, hence probably the reason why the testes, especially the right, to the descent of which no mechanical obstruction was opposed, still constituted a part of the contents of the sac at a period we might naturally have expected to have found them in or near the inguinal canal, if not in the scrotum.

The fundus of the bladder projected slightly from the pelvis into the sac, to the lower part of which it was adherent. The structure and appearance of the pelvic organs generally were normal.

The course and relations of the larger blood-vessels were peculiar and well worthy of notice. The abdominal aorta had been drawn considerably to the left of the median line, by the continued traction and weight of the eventrated viscera. On the right side, it was in immediate relation with the right ureter, and on the left side with the *vena cava inferior*. It presented a considerable curve in its course downwards; the convexity of the curve looked towards the left side. The *vena cava inferior*, even more displaced than the aorta, with which, as just mentioned, it had an abnormal relation, was situated between the last named vessel and the left ureter. It entered the posterior part of the liver to the right of the enlarged *lobus spigelii*, and passed through it and the diaphragm to the heart. In consequence of the change in the relative position of the aorta and the *vena cava inferior*, the normal relations and usual dimensions of the renal veins were reversed. The right vein passed over and anterior to the aorta, and was consequently longer than the left,—characters which usually distinguish the latter.

The umbilical vein and both umbilical arteries existed and were of the usual size. The umbilical arteries presented no peculiarity worthy of mention. The umbilical vein ascended to the liver on the right margin of the fissure, and entered directly into its substance, as I have before stated, though a slight depression on its inferior border. It had no communication with the portal vein, which was normal in every respect, nor had it any direct communication with the *vena cava inferior*, for there was not the slightest trace of a *ductus venosus*.

The diaphragm had been drawn down to a considerable extent by the weight and traction of the viscera, and presented several transverse foldings, especially on the left side.

The thoracic viscera were well formed in every respect, and appeared perfectly healthy. The heart was displaced, and seemed

slightly enlarged. The base was drawn down and to the left of the median line, while the apex was thrown towards the right, and pointed to the space between the seventh and eighth ribs on the right side.

Besides the malformations and the deviations from the normal arrangement of the viscera already enumerated, there were others presented by the trunk and the extremities which require brief notice. Amongst the most remarkable of these was a considerable lateral and antero-posterior distortion of the vertebral column, which caused the trunk to be bent forwards and to be somewhat doubled on itself, whilst it projected considerably to the left side. The lumbar vertebræ were principally involved in the distortion, and formed a curve, the convexity of which looked towards the left.

Both the superior and the inferior extremities were deformed, the former presenting malformation by redundancy, the latter malformation by defect. The arms were somewhat flexed and distorted. Each of the hands were polydigital; the right having a sixth finger almost completely developed on the inner side of the fifth metacarpal bone; and the left having also a supernumerary but very rudimentary digit, on the corresponding metacarpal bone. The legs were much twisted, and the feet affected with talipes. The left foot had only four metatarsal bones and three toes; the proximal phalanx of the great toe appearing to articulate with two of the metatarsal bones. The right foot possessed four toes, the second consisting of the rudiments of two placed side by side, and conjoined at their proximal extremities.

Case II. The next monster I have to describe was a female foetus, nearly full grown, which had a more extensive, more complete, and at the same time more complicated eventration than that just noticed. The sac and the viscera had been much lacerated and bruised during the expulsion of the foetus through the maternal passages; and moreover the whole body, but more especially the eventrated parts, were in a very soft state when it reached me, in consequence of the time that had elapsed between the birth of the foetus and its receipt at the university. I mention these circumstances, because they prevented me from making a very accurate examination of the general arrangement of the parts, and will consequently prevent me from describing their anatomy with such minuteness as I could have desired.

Although the sac had been almost entirely destroyed, yet some shreds, or riband-like portions that still remained attached to the trunk, enabled me to demonstrate its existence, and to analyze its structure. It resembled the sac enclosing the viscera in the preceding case in its general appearance, but differed from it in

one important respect, namely, that it consisted of two instead of three layers, which, although matted together here and there by numerous small isolated patches of coagulable lymph, were not adherent to any of the viscera. The outer layer was traced in connection with the integument of the abdomen and of the thorax, and with the theca of the umbilical cord; it was hence known to be the amnion. The inner layer was continuous, with the serous membranes lining the abdominal and thoracic cavities, and was discovered to be compounded of the parietal layers of the peritoneum and pleura.

The eventrated viscera were the heart and the lungs, the liver, the spleen, the kidneys, and the suprarenal capsules, the stomach, and the larger proportion of the intestines. The fissure or space in the parietes of the trunk, through which they were connected to the rest of the body by their blood-vessels, nerves, and mesenteries, extended from near the first rib to the pubis, and inclined to the left of the median line. Its breadth did not correspond in any degree with its length, for it did not measure more than an inch and a half across at its widest part.

The lungs, although thrown out off the thorax, and exposed to the usual modifying influences, were not at all malformed, and appeared normal in every respect. The heart was removed entirely from the thorax, and was placed near the situation of the umbilicus, its apex pointing to the left side, and, from a considerable distortion of the trunk, nearly touching the pubes. It was flattened out, and was very obtuse at its apex, so that it resembled the heart on a playing card in its general contour. The vessels at the base were observed not to have their normal position, and therefore the structure of the heart itself was examined, and the following interesting arrangement of the parts was disclosed by a little dissection. The ventricles, as far as their general structure, and the thickness of their walls are concerned, were naturally and perfectly formed. The auricles were also normal. The ventricular septum, however, exhibited an appearance which is quite unusual at the period the foetus was born; it was incomplete above, a free communication existing between both ventricles over a well-defined semilunar process of the substance of the heart, which projected upwards from the apex, and separated them at their lower part.

Both ventricles opened into a common vessel situated at their base. This vessel presented three well-defined semilunar valves at its commencement. It expanded into a large bulb or sinus immediately above the valves, and shortly after contracted again, and then continued onwards without any very marked increase or decrease in its calibre, at least for some distance. It formed an arch, from the summit of which three vessels passed off, whilst a

fourth was sent off from its concavity. The latter vessel attracted immediate attention, from the singularity of its position, and its distribution. It commenced at the concave side of the arch, near the constricted part of the bulb of the trunk from which it was derived, and after passing upwards a short distance, divided into two branches, one of which passed immediately into the left lung, whilst the other coursed behind and beneath the arch of the primary vessel, and having subdivided, entered into the three lobes of the right lung. The three branches that came off from the summit or convexity of the arch were severally the innominate, the left carotid, and the left subclavian arteries.

From the nature and distribution of these vessels, it would appear that the larger vessel, that which opened into both ventricles, was the aorta, formed to receive the blood simultaneously forced into it by both ventricles; and that the vessel given off from its concavity and distributed to the lungs was the pulmonary artery, which, although of such small size, was large enough to convey the requisite amount of blood to the lungs for their growth and nutrition during foetal life.*

The liver was somewhat compressed and flattened, but still appeared globular. It occupied an oblique position from left to right, and rested chiefly on the kidneys, spleen, and stomach. The *lobus spigelii* was increased in size, and projected forwards from the surface of the liver. It pressed against the gastro-hepatic omentum, in which it had made a considerable impression, but it did not appear to have displaced the stomach, at least to any very great extent. It had been broken off from the body of the liver.

The stomach was elongated and puckered. It had an oblique direction from left to right, the greater extremity looking upwards and the pylorus looking downwards. It rested, before the parts had been displaced, on the enlarged *lobus spigelii*. The intestines were puckered together in the same manner as those in the first monster, but from a different cause. The mesenteries appeared to be simply drawn together and constricted at the margins of the fissure, without any inflammatory contraction or thickening being visible.

The spleen was flattened and fissured, but had no hilus. It was placed above all the other viscera and behind the liver. The pancreas was dissected, but nothing can be said about it, since it had broken up into several small pieces.

The left kidney and the left suprarenal capsule were displaced, but retained their ordinary shape and appearance. The right kidney was triangular and fissured, and was situated at some dis-

* It would be more consistent with correct anatomical description to consider the enlarged portion of the vessel arising from the ventricles as a *bulbus arteriosus*, and the pulmonary artery and the aorta as its branches.

tance from the corresponding suprarenal capsule. Both the latter seemed to have suffered severely from compression by the liver. The ureters descended in the normal manner to the bladder, which projected slightly from the lower part of the fissure.

The genital organs, both internal and external, were perfectly well formed. The latter, as well as the anus, which was perforate and of its ordinary size, were drawn somewhat forwards and to the left side.

The vertebral column presented a considerable lateral curvature, which involved the dorsal and lumbar regions. The convexity of the curve looked towards the left. The vertebral column also exhibited an antero-posterior curvature, by which the body was nearly doubled on itself. The anterior extremities of the ribs on the left side were wanting.

The superior extremities were wonderfully deficient. The left arm was altogether wanting, not the slightest rudiment of any part of it being discernible. Near the place where the shoulder should have been, a small depression in the integument was observed, but there were no marks of a cicatrix. The right upper extremity appeared like a long pyramid, curved at its apex. It seemed, before it was dissected, to consist of an arm, a fore-arm, and a finger, which was partially flexed. On cutting into it, no trace of muscular fibre could be discovered in any part below the scapula; adipose tissue and condensed cellular membrane alone seemed to form the whole of the fleshy part of this singular looking extremity. The bones were seen to be arranged in the following manner. The humerus was articulated to the scapula above, and ankylosed to a bone, which might be held to represent the radius, the ulna, or both, below. Where the ankylosis or junction existed, there was a slight curve, and as slight a projection. At the lower extremity of this bone, a pile of five cartilaginous nodules were detected, which might be severally supposed to represent the carpus, metacarpus, and phalanges.

Case III. I am unable to give a full description of the anatomy and general appearances of this third monster, since the eventrated viscera had been cut out, attached to the umbilical cord and a portion of the integuments of the abdomen, whilst the body was consigned to the grave. Still, the parts that have been preserved will enable me to point out a few circumstances that appear worthy of notice.

The sac seemed to have been attacked by inflammation at some period before the birth of the foetus, for it was inseparably united to the protruded viscera by lymph or some other matter. It could not be removed from the viscera even by a scalpel. At its circumference, however, it was separated with a little care into two layers, which I need particularise no further than to say that

they were the amnion and the parietal layer of the peritoneum. It seemed to enclose the intestines in a kind of close leathery tunic.

The stomach, the spleen, and a considerable portion of the intestinal canal were all the viscera that had been displaced. The stomach was very much contracted, and was tied to the left margin of the fissure, which was evidently of slight extent. The spleen was very small, and appeared like a piece of glandular flesh rolled up into a ball about the size of a nutmeg. It also was closely invested by the sac. The gut was very much puckered, more so than in either of the preceding monsters. This circumstance is explicable on the great contraction which the mesentery had undergone from the inflammation.

I am unable to state whether or not the trunk of the monster was distorted, or the feet and arms imperfect or deformed; but I have no doubt they must have been to some slight extent.

General Remarks.—The three cases of monstrosity I have just described are good examples of some forms of that large and extensive group of malformations by displacement, and by arrestment of development, which are characterised and are known by fissure of some part of the anterior parietes of the trunk; by eventration forwards and to one side of part if not of the whole of the viscera normally contained within the abdomen, the thorax, or both these cavities; by the existence of a sac depending from the parietes of the trunk which is composed of several peculiar structures and invests the displaced viscera; by deformity or defective development of other parts of the body; and by a combination of circumstances which render the foetuses, so malformed, unviable.

The fissure in the parietes varies considerably in its extent and in its position in almost every individual case of the malformation; it appears always, however, to occupy more or less of one of the three following positions; first, the abdominal parietes; secondly, the abdominal and thoracic parietes; and thirdly, the abdominal and pelvic parietes. To these three different positions of the fissure, a fourth must be added in which it involves the whole length of the trunk. Now it has been observed that the viscera present certain differences in their structure and in their relative position according to the site and extent of the fissure; and these differences, combined with a relation supposed to exist between the nature of the eventration and the deformity or defect of other parts of the body, have been adopted by Isodore G. St Hilaire* as the basis of their arrangement into a natural family, which is subdivided into many distinct genera.

The following table exhibits the arrangement followed by St Hilaire.

* *Histoire des Anomalies*, vol. ii. p. 266.

A. Monstrosity not involving the thoracic region.

1. Lateral or median eventration occupying principally the lower portion of the abdomen ; urinary apparatus, genital organs and rectum opening externally by three distinct orifices. Family I. *Aspalosomus*.

2. Lateral or median eventration occupying principally the lower portion of the abdomen ; genito-urinary apparatus absent or very rudimentary. Family II. *Agenosomus*.

3. Lateral eventration occupying principally the lower portion of the abdomen ; absence or very imperfect development of the pelvic member of the side occupied by the eventration. Family III. *Cyllosomus*.

4. Lateral or median eventration throughout the whole length of the abdomen ; the trunk curved after the abdomen ; the pelvic members absent or very imperfect. Family IV. *Schistosomus*.

B. Monstrosity reaching the thoracic region also.

5. Lateral eventration occupying principally the superior portion of the abdomen, and involving also the anterior part of the thorax ; atrophy or very imperfect development of the thoracic member of the side occupied by the eventration. Family V. *Pleurosomus*.

6. Lateral or median eventration with fissure ; atrophy or total want of the sternum and hernia of the heart. Family VI. *Celosomus*.

In this classification of Isodore St Hilaire much stress is laid on the position of the eventration and on the degree of imperfection of the extremities, independent of the characters afforded by the displaced viscera for the distinction and recognition of genera. Thus the third and fourth families, the *Cyllosomus* and the *Schistosomus*, which do not present any material differences in the conformation of the viscera, are separated from each other in consequence of the eventration being lateral, and one of the inferior extremities being imperfect in the one, and of the eventration being either lateral or median, and both lower extremities being absent or very imperfect in the other. And again, the fifth family is distinguished from both these, in consequence of the thorax being slightly affected, and by one of the superior extremities being imperfectly developed. Now, if characters such as these were generally adopted as the basis of a classification of monsters with eventration, the number of distinct genera would be increased to an almost indefinite extent, and it would be rendered necessary to coin a new name for almost every individual example that has been described. Such characters, however, are fallacious and totally inadequate, and unfit for the purposes of a sound classification.

In the first place, the eventration is never truly median, but

always lateral. In every instance of this form of monstrosity that has been described and figured, the umbilical cord, when it is present, or the umbilical vein, when the cord is absent in consequence of the placenta being adherent to the eventration, is found to occupy a lateral position in regard to the eventration, to terminate more or less directly in the integuments and in the sac, either on the right or on the left side of the fissure in the abdominal parietes. In the normal state, the umbilicus is placed in the median line of the body; hence, if the position of the umbilical cord, or the position of the umbilical vein, be taken as affording satisfactory evidence of the exact situation and relations of the eventration, we shall find that the viscera are invariably displaced from the abdominal cavity on one or other side of the median line, in other words, always occupy a lateral position.

In the second place, numerous examples of this form of monstrosity are recorded, in which the fissure has extended through the whole of the abdominal and also through part of the thoracic parietes, without either one or both of the superior extremities, or even the inferior extremities, being imperfect, although they were deformed. In fact, some of these monsters, instead of presenting defective development of the extremities, exhibit evident signs of malformation by redundancy. I shall have occasion, as I proceed, to point out many other circumstances which show the insufficiency of St Hilaire's arrangement. To enter into the various points in which it is defective, would oblige me to anticipate the whole history of these monsters.

A careful examination and revision of the numerous cases of eventration which have been recorded by recent observers have led me to believe that they may be most satisfactorily arranged according to the peculiarities they present in the conformation of the viscera, irrespective of the condition of other parts which I esteem of secondary importance in their history; and that a classification, based on such peculiarities, or rather characters, will give a more comprehensive and more concise view of the present state of our knowledge of the organization of these monsters than one erected on the innumerable modifications in the development of the extremities, or on other variable characters; and will include all those cases, by no means few in number, which it would be otherwise absolutely necessary to separate from the rest, and constitute into distinct genera.

Taking the conformation of the viscera as a guide for a natural arrangement, I shall separate these monsters into two groups, namely, monsters with simple, and monsters with complex eventration. The first group will comprehend all those monsters in which the displaced viscera present alterations in their configuration only. It admits of no subdivision. The second group will

comprehend all those monsters in which the bulk of the viscera are not only malformed, but, at the same time, exhibit some very material defect in their development. This group admits of subdivision into genera, each genus being characterized by the imperfect development of some peculiar viscus or viscera.

The following table will show the nature of the arrangement I have thought proper to adopt for the purpose of detailing the organisation of these monsters.

"A," monsters with simple eventration.

Family I. Eventration involving more or less of the abdominal or of the abdominal and thoracic viscera ; the viscera for the most part simply malformed.

"B," monsters with complex eventration.

Family II. Eventration abdominal and pelvic ; the intestinal canal more or less incomplete ; the cæcum and the genito-urinary apparatus opening by distinct apertures in a cloaca.

Family III. Eventration abdominal and pelvic ; the genito-urinary apparatus imperfect ; the intestinal canal normal.

Family IV. Eventration abdominal and thoracic ; the heart displaced and imperfect.

Family V. Eventration pelvic, abdominal and thoracic ; the cæcum and genito-urinary apparatus opening into a cloaca ; the heart displaced and imperfect.

Before commencing with the special consideration of each group of these monsters, I may remark that the above table, and the following descriptions, do not probably embrace all the different forms of eventration that have been observed, for it is utterly impossible to take cognisance of a very large number of the recorded cases, in consequence of the very vague and obscure statements and figures with which the notices are accompanied. I shall be enabled, nevertheless, to point out the more striking and important features in the anatomy of these monsters, and to indicate where our information is defective.

CLASS I. FAMILY 1ST.—“MONSTERS WITH SIMPLE EVENTRATION.”—This group includes by far the greater proportion of the recorded cases of monstrosity with eventration, and comprehends all those in which the fissure extends through more or less of the abdominal parietes, and it may be of the thoracic parietes, the viscera being displaced, and presenting such modifications in their configuration only as are referrible either to a change in their relative position, combined with the action of pressure in certain directions ; or to an unnatural increase of the normal size of some parts ; or to disease ; or, lastly, to a combination of all these modifying influences.

The smallest, and, at the same time, simplest eventration that has been recorded, is that presented by the third monster describ-

ed in the first part of this notice, and which consisted of the stomach, of part of the intestines, and of the spleen. From this we are led by a gradual series of gradations to the highest form of the simple eventration ; the liver, one or both kidneys, and supra-renal capsules ; the pancreas, the testes, if the monster be male ; the heart ; and, lastly, the lungs, being successively added to the eventration, in the order I have enumerated, the displacement then involving almost all the abdominal and thoracic viscera.

When the liver is displaced, which it usually is, it appears to undergo greater alteration in its configuration than any other organ in the body ; a circumstance which seems to depend on its great size, and on its very prominent position leaving it exposed to the influence of every modifying action, but more especially to that of pressure. Its edges are rounded off; its right and left lobes are thrown together and undistinguishable ; and thus it loses its peculiar elongated flattened figure, and assumes one more or less globular. Its substance, in fact, becomes compressed into that form which permits the greatest amount of material to be enclosed in, and therefore occupy the least space. The extent of the modelling process by which the liver is made to assume a somewhat globular form is beautifully illustrated by those cases, by no means uncommon, in which the umbilical vein, instead of coursing along the posterior surface of the liver, is enclosed within its substance, which would thus appear to have been moulded on and around the umbilical vein during the development of the organ.

It must be remarked, however, that although the form of the liver is very generally altered, in the way I have just described, yet it is not invariable ; for, occasionally the lobes are distinct, and retain their normal shape, the shape of the liver not being materially altered. This latter circumstance is of very unfrequent occurrence, and may be justly esteemed as an exception to the general rule.

I have not met with any case on record in which the *lobus Spigelii* presented the remarkable development, and had effected so great an alteration in the position of the stomach, as in the first monster I have described. Otto* mentions a somewhat parallel instance, in which the liver seemed to consist of two distinct portions ; the smaller portion being adherent to the larger, at the transverse fissure, the two being united by the *vena cava inferior*. It is interesting to observe that this enormous increase in the size of the *lobus Spigelii* is merely an exaggerated state of the normal state of the lobe, and that it affords a striking example of the power nature possesses of preventing pernicious results from en-

* Histor. Sexcent. Monstr. Wherever reference is made to the observations of Otto, which I shall frequently do, it is always to this work, and to one or more of the monsters between the DXIV. and DXLIV. cases.

suing on abnormal actions, by taking advantage of the tendency which some organs exhibit of enlarging in certain directions. I have made observations on more than 120 subjects in the dissecting room of this University; and they appear to me to show that the size of the *lobus Spigelii* bears an inverse ratio to that of the left lobe of the liver; that it is largest when the left lobe is smallest, and *vice versa*. No part of the liver in the normal state offers more peculiarities in its form and size than the *lobus Spigelii*.

The gall-bladder is sometimes wanting; and, when present, is always found in a collapsed state. There is also usually a depression in the liver into which it is received. The *ductus communis choledochus* appears to be always present and normal.

The stomach presents little worthy of notice. Its form is seldom altered, but its position may be altered considerably, as we have already seen.

The intestines are always displaced to a very great extent, and present some appearances which are peculiar to this form of monstrosity. In the first and third of the monsters I have described, they presented very evident signs of having been the seat of inflammation. It would appear, however, from the observations of others, that the gut, in the majority of cases, is free from disease, and is distended with meconium. Frier* describes a monster with simple eventration, in which the intestines were both greatly inflated and inflamed; and Otto mentions several others in which there were indications of inflammation having attacked the gut at some period before birth. I have already spoken of the puckered appearance of the intestinal canal in these monsters, when describing the three cases I have noticed, and have only to add, that it is produced by a contracted and constricted state of the mesentery and mesocolon, which is induced, either by the tight embrace of the fissure, or by inflammation, the latter appearing much the more effectual of the two.

The rectum is never displaced from the pelvis. It is also perfect, and terminates at the anus, which is usually drawn forwards, and to one side, by the weight and traction of the viscera.

The spleen, the pancreas, the kidneys, and the supra-renal capsules are found differently modified and malformed, in different cases, according to the position they may happen to occupy in the eventration, and to the age of the individual. They may be more spherical or more flattened than usual, or they may be pyriform or pyramidal; in fact, they present every variety of form and figure which these organs may be made to assume, by pressure operating in different directions during development. The spleen is always found without the abdomen resting on the imperfectly-

* Sandifort, Thesaurus, Vol. i. p. 314.

formed parieties. One or other of the kidneys and supra-renal capsules will also be discovered without the abdomen, whilst the opposite one is only partially displaced. The pancreas is always displaced, but is never carried much out of its usual position, relatively to the other viscera.

The testes present great variation in their position in different cases, a circumstance easily accounted for, in the alteration they naturally undergo in their position during their transit from the abdomen to the scrotum. It is seldom that they are found in the eventration, and, when discovered in it, it is usual to find one more retarded in its course than the other.

When the lungs and heart are eventrated, they do not offer any peculiarities worthy of mention, except the alteration in their position, which is sometimes very great. When they are contained within the thorax, the heart generally presents a remarkable displacement, which has not been much attended to by those who have dissected and described examples of this monstrosity. I have noticed in one case, and Otto has remarked in many others, that the heart, instead of being situated obliquely in the thorax, assumes a perpendicular, or more frequently, according to Otto's observations, a transverse position. This arises from the displaced abdominal viscera dragging downwards the *vena cava inferior*, which, reacting on the base of the heart, throws the apex of that organ more or less out of its position. It will be readily seen that it is only when the viscera depend greatly from either the right or the left side of the abdomen, that the heart will be found to occupy either of the abnormal positions above described, since the base of the heart must not only be dragged down, but also be carried towards one or other side of the body, before the apex of the heart can be made to revolve and point directly outwards. This is found to be the case, for it is only when the viscera incline very much to one side that the heart is found displaced.

The diaphragm, if the thorax be not involved, will be perfect, but of course will be greatly displaced. If the thorax, however, happen to be fissured, and its viscera be eventrated, then the diaphragm will be imperfect at its sternal and costal border; the degree of imperfection varying with the extent of the fissure, and the degree of completeness of the eventration.

The organs of generation, both internal and external, are generally well formed; the latter will be found inclining somewhat towards the side occupied by the eventration.

The larger blood-vessels are always carried to one side by the viscera, and their relations will be modified accordingly. It is needless for me to particularize the many variations which have been noticed, since their arrangement, as described for my first

monster, will suffice to give an idea of the usual appearances presented by them. One circumstance connected with the umbilical vein requires some attention. The curious aberration from the normal distribution and communications of this vessel at the liver, observed by myself, does not appear to have a parallel on record. There is frequent mention in Otto's great work on monsters of the umbilical vein penetrating directly into the liver, but there is no notice made of its ultimate distribution ; it would appear, however, from an observation of Breschet's on a monster with complex eventration, that the umbilical vein, although it does enter the upper surface of the liver, may yet have direct communication with the portal vein and the *vena cava inferior*. What may be the exact distribution of the vessels of the liver, where no direct communications between them can be detected, still remains a mystery. The liver in my own case was attempted to be injected, but the attempt was unsuccessful. We might perhaps be enlightened on this curious and interesting subject by subsequent observations made under favourable circumstances.

It would appear from the observations of Meckel* and Otto, that it is not uncommon for one of the umbilical arteries to be absent ; and what is more remarkable, whenever it is absent, it is invariably the right.

In connection with the modifications in the configuration of the eventrated viscera, it will be necessary for me to offer a few remarks respecting the state of the extremities and of the skeleton generally. One or more of the extremities are deformed and generally imperfect. The deformity is usually, but not invariably, confined to the feet and hands, the former being affected with talipes, the latter being twisted in various directions. The imperfection, when present, exhibits every grade of complexity between the absence of one or two toes or fingers, and the complete absence of one or both of the superior or of the inferior extremities. It is uncommon, however, to meet with the total loss of a limb, though many cases of the kind are recorded ; for rudimentary traces of it might be seen, or the whole limb might be much atrophied. It might be stated as a general rule, that the malformed extremity is closely related to the site and position of the eventration ; thus, the eventration being restricted to the abdomen, the lower extremities will be imperfect, but having involved the thorax, the superior extremities will be chiefly implicated ; and, moreover, the eventration inclining to the left side, the left extremity, whether it be arm or leg, will be the one found imperfect, or depending from the right side, the right extremity will be discovered to be defective of some part. This

* Hist. Monst. Nonnullor. and other works of this author.

rule would appear to point to some influence exerted by the even-tration over the extremity, which influence would seem to act uniformly; but we cannot trace any influence, direct or indirect, causing uniform imperfection of the extremities, which should happen if there was any real connection between the even-tration and the malformed extremity or extremities. It will be as well, perhaps, to illustrate this by mentioning the more striking exceptions to the general rule. 1. The abdominal viscera alone being eventrated, the lower extremities are not malformed; on the contrary, they are perfect, whilst one of the upper extremities is imperfect. An example of this variation is given by Otto,* in which the feet were perfect, and the right hand had but three fingers. And another still more striking is noticed by Cam, (Med. Phy. Journ. No. 39,) where the lower extremities were perfect, but the left upper extremity was altogether absent, there being "no clavicle, no scapula, no humerus, or any arm on the left side." 2. The abdominal viscera being eventrated, and inclining greatly to one side, the opposite limb, and not the one corresponding to the even-tration, is imperfect. As an instance of this, I may quote a case recorded by Humby,† in which, the even-tration inclining to the left side, "the left foot was perfect," but "the right was shapeless, and had two toes only." 3. The even-tration being in the same condition as in the last-mentioned exception, both, and not one of the lower extremities, are malformed. This is the most common variation met with. For an example of this, I may refer to the description of the first monster noticed in this paper, where it is seen in its slightest degree; and to a monster described by Fingerhault,‡ which appeared to have one extremity wanting, and the other in an extremely rudimentary state, for its highest degree.

It is to be remarked, that although these monsters are characterized by malformation by defect of development in more parts than one, yet some of them exhibit at the same time malformation by redundancy. This circumstance appears somewhat paradoxical, but yet is one of the most curious and most remarkable features in the history of these monsters. I have only to refer to my first monster, which had an additional finger on each of the hands, and to one described by Hasenest,* which had a super-

* Op. cit. Case DXXI.

† Humby, Med. Phy. Journ. vol. iii.

‡ Meckel's Archives fur Anatom. und Physiolog. t. i. p. 109. 1826. It is impossible to determine from Fingerhault's description to what class of even-tration the monster is to be referred. I have little doubt that it was a simple even-tration, although this cannot be made out. The case is merely referred to as an example of the highest form of the defective development of the extremities in these monsters.

§ Hasenest, Act. Academ. Nat. Cur. t. vi. Obs. x. 1742.

numerary toe on one of the feet, as examples of this kind of malformation.

The trunk is invariably distorted, but the degree of distortion varies in every individual case, without any relation to the extent of the eventration. When the trunk is but slightly distorted, the lumbar vertebræ alone appear to be implicated; but when it is very great, the whole vertebral column, the pelvis, and the ribs are all twisted and displaced, so that they appear to unite in causing the distortion and excavation of the trunk, by coalescing and pressing one on the other. It is to be remarked that the trunk, in very severe cases, becomes doubled on itself, and this doubling appears to be different in its character in the human foetus and in the young of the mammals. In the human foetus, when the body is doubled on itself, and this happens more or less in every case, the vertebral column is bent back, so that the chest and pelvis are approximated. The doubling up of the trunk in the eventrated monsters of the lower animals differs from that of the human foetus in a most material point. Here the trunk is bent downwards (anteriorly), and sometimes to an almost incredible extent, causing the sacrum to come into immediate contact or into close relation with the lumbar, dorsal, or even cervical spines.

The greatest degree of distortion being seen in monstrous foetuses taken from the sheep or cow, I shall give a brief account of the peculiarities seen by Otto* in the skeleton of one from which the viscera had been removed, more especially as it shows how greatly the bones of the trunk may be altered in their form by the occurrence of an eventration. "The left ribs were small, compressed, and hid from view under the left scapula. The pelvis was curved backwards and to the right side, so that the brim looked backwards, and the anus and tail were directed forwards and rested on the right thoracic parietes. The posterior extremity of the vertebral column was so distorted that the spines of the sacrum were opposed to those of the anterior lumbar vertebræ, their apices being united by ligamentous substance. The spinous processes of all the lumbar vertebræ, and of the last dorsal vertebra were greatly curved, and were ankylosed and conjoined. The left ribs could not be enumerated, because all, with the exception of the first, had been united into one great osseous lamella. There was no vestige of a sternum."

The ribs or the sternum, or even both, are always more or less imperfect when the thoracic viscera are eventrated.

I have described the chief peculiarities presented by monsters with simple eventration with this degree of minuteness, and have pointed out where the modifying actions are seen to exert their influence in the most striking manner, not only because monsters

* Op. cit. Case DXXX.

of this class are of the most frequent occurrence, but because the same peculiarities and the same modifying actions are observed in the next class, and hence much repetition, otherwise necessary, will be avoided. I now pass on to the consideration of

CLASS II. "MONSTERS WITH COMPLEX EVENTRATION."—The preceding group of monsters, we have seen, are characterised by the viscera being modified in their configuration by pressure, as instanced by almost all of them; by increased development of some parts, as in the case of the *lobus Spigelii* in one of my own cases, and in another noticed by Otto; and by disease, of which we have a most striking example in the puckering of the intestinal canal as the result of inflammation of the mesenteries. In this group, which comprehends all the more grave instances of eventration, we have—in addition to the different circumstances causing an alteration of the configuration of the viscera—a very important character, which separates it at once from the preceding, namely, defective development of one or more of the viscera, which induces an alteration in their "conformation."

It will be seen by reference to my arrangement that three different systems are liable to be imperfectly developed, the digestive system, the genito-urinary system, and the vascular system. It will also be seen that I have arranged the examples of complex eventration into four families, according to the system which might be most imperfect. The first and second of these families, although widely separate at their two extremes, are united by intermediate forms, which lead gradually from the highest form of the malformation to the preceding group, in which the viscera must be considered to be in a comparative state of perfection. The third family presents the opposite extreme to the two former families, the thoracic, instead of the pelvic and abdominal organs being imperfect; it is interesting to observe, however, that we are enabled to trace a transition from its typical form towards the simple eventration. The two extremes of imperfection are united by a fourth family, which presents the intestines, the genito-urinary apparatus, and the heart imperfect in one individual. With these preliminary remarks I shall proceed to trace the relation which each family bears to the others, by describing first what might be considered to be the typical form of the peculiar malformation, and then the transition forms, as far as observation will carry us.

FAMILY 2d. This family is characterised by the colon being more or less defective, by the cœcum opening into a cloaca situated in the right groin, in which the orifices of the genito-urinary apparatus also terminate. The principal feature in this family is the cloaca, which is dependent, as will appear hereafter, on the imperfect condition of the intestinal canal, and on the perforate state of the cœcum.

The most perfect and typical examples we have of this genus are those monsters which have been described and figured by Petit,* Knox† Otto,‡ and Vrolik,§ which, as they present nearly the same peculiarities, except such as arise from a difference in sex, I shall notice in common.

The small intestines are for the most part perfect, and terminate as usual at the right iliac fossa in the cœcum, which appears to be the only part of the large intestine developed. The cœcum, known by its peculiar sacculated appearance and by the valvular termination of the small intestines, opens more or less directly by a large orifice, sometimes provided with a distinct sphincter muscle, which then diminishes the size of the aperture, into a cavity situated in the right groin. This cavity, or, as it is more properly called, cloaca, has either a mucous or an integumentary surface. It is generally of large size, but its form and figure vary. It receives, besides the opening of the intestinal canal, through which the meconium may be readily made to flow by pressure on the gut, the external orifices or apertures of outlet of both the genital and the urinary organs. The number and nature of the orifices which open into it vary, as we shall presently see, according to the sex of the monster and to the degree of imperfection in which the genito-urinary apparatus is found. The bladder is usually, but not invariably, imperfect; and, when imperfect, is prolapsed and inverted, so that its posterior surface, soft, spongy, rugous, and vascular, comes to form a part of the posterior parietes of the cloaca. The bladder, when inverted, is usually spoken of as a small vascular raised surface on the posterior part of the cloaca.

When the monster is a female, the sexual orifice, which may open from the cloaca into the vagina or into the uterus, will be discovered immediately above, or, it may be, below that of the intestinal canal. The ureters will be found opening separately, and on opposite parts of the cloaca, either on each side of the sexual orifice, or laterally between it and the false anus. When the monster is a male, the arrangement of the orifices must necessarily differ, although the analogy is preserved. The bladder being inverted, we should naturally expect the ureters would open at once on the surface of the cloaca, but it would not lead us to anticipate the union of the ureter and the *vas deferens* on each side, which, forming a common excretory canal, terminates near the centre, or, it may be, near the margin of the cloaca. From these observations it would appear that a monster typical of this family, and

* Memoires de l'Acad. des Sciences. 1719. P. 89.

† Edinburgh Journal of Medical Science, Vol. i. p. 343.

‡ Op. cit. in many different cases.

§ Tabulae ad illustrand. embryogen. hom. et mammal. tam natur. quam abnormal. Tab. xxi.—xxiii.

having the female organs of generation, would be found to have four orifices in the cloaca, one leading into the intestinal canal, one into the sexual organ, namely, the vagina or uterus, and the other two into the ureters ; and that one having a male generative apparatus, would present three orifices only, namely, one leading into the cœcum, and two common to both, the generative and the urinary apparatus.

These orifices, however, may not all be present, or may even be more numerous in some particular examples which depart from the typical form either from or towards the state of perfection. It would be useless for me to recount all the numerous varieties in the conformation of the genito-urinary apparatus that have been observed and recorded ; suffice it to say, that they exhibit differences in every individual case, although they sometimes approach very closely to each other, and that they present every gradation from comparative perfection to total absence. I shall only point out those varieties which give rise to a diminution or to an increase in the number of orifices in the cloaca. If the urinary organs advance one step towards perfection, and the bladder be found perfect, which is certainly a very uncommon occurrence, then the number of orifices will be diminished ; the urinary organs opening by one and not by two orifices, that single orifice being the rudiment of the urethra, which is then seen as an infundibuliform prolongation of the urinary bladder. The same diminution will be observed if the urinary organs be more imperfect than usual, as for example, if there happen to be but one kidney and but one ureter, or two kidneys and two ureters, but one of the latter cœcal and free at its extremity, examples of which may be seen in the works of St Hilaire* and Otto. One of the openings must then be necessarily absent. We observe here that the number of orifices in the cloaca decrease whether the urinary organs progress towards or from perfection ; the opposite statement holds good with regard to the generative system, and particularly to the female, for if it advance towards perfection, no difference will be observed, the vagina still opening into the cloaca ; but if it recede from perfection, then two different effects will result, according to the stage of imperfection. If the generative organs be absent, as will be noticed in some cases of Otto's and in one by Breschet,† the sexual orifice will of course be wanting, and there will be the loss of one opening at least. If, however, the organs be not absent, but remain in a rudimentary state, as for instance in their early bifid state, when there are two vaginæ, two separate cornua and bodies of the uterus, &c., it will be seen that the number of apertures will be increased instead of diminished. The only instance

* Annales des Sciences Naturelles, t. iv. p. 452 et sequent.

† Med. Chirurg. Transact. of London, vol. ix. p. 433.

I know of this kind is one described by Meckel,* to which I refer principally on account of the beautiful delineation of the parts concerned in the formation of the cloaca.

I may briefly state, without pursuing this most interesting subject further, that the number of orifices seen in the cloaca may range from one which will be that leading from the cœcum, the genito-urinary apparatus being entirely absent, to five, the typical number being three when the monster is a male, and four when it is a female.

The colon in some few cases presents a somewhat greater degree of perfection than in those typical of the family. The advance of the colon towards perfection leads towards complete development of the intestinal canal, and therefore to the next family in which the genito-urinary organs alone are malformed. A monster described by St Hilaire† presents us with one step towards the more complete development of the intestinal canal. In it the colon was prolonged onwards and terminated in a cul-de-sac at the point where the superior mesenteric artery usually ceases to supply it with blood. Otto‡ gives us another and apparently a more advanced stage, the highest probably that has yet been observed in a monster, the colon of which appears to have been developed nearly throughout its whole extent, for it is said to terminate in the middle and anterior part of the pelvis. I might mention some others, but it seems unnecessary. It might be remarked, however, that although our existing knowledge of the nature of the colon in these cases is very slight, and its degree of development is not well ascertained, it is highly probable future observations will throw some light on the subject, and may even present us with a monster having its intestinal canal nearly perfect, its rectum complete but its anus imperforate; we only want an observation of this kind to fill up the hiatus which exists in the chain of perfection.

It is interesting to observe, that although the intestinal canal is so strikingly malformed by defect of development, it not unfrequently presents malformation by redundancy, in the form of a supernumerary appendix vermiciformis opening into the cœcum.

We have seen that the internal organs of generation are more or less imperfect, and that in a manner which might lead us to anticipate great imperfection of the external organs. This is indeed the case. The male intromittent organ is represented by a papilla situated a little below and to the left side of the cloaca; that papilla being usually provided with a glans and a prepuce, but imperforate. This papilla is not always seen. The scrotum, when present, consists of two folds of the integument widely separate

* *Hist. Monstr. Nonnullorum*, p. 42, Plate vi. figs. 1 and 2.

† *Loc. cit.*

‡ Case DXXXV.

from each other. The external organs of generation in the female are still more rudimentary. The *labia pudendi* are recognised as a fold of the skin placed on the upper part of either thigh; this curious position has been accounted for by Breschet,* who supposes the labia to be drawn asunder by the bending of the trunk, and distortion and separation of the lower extremities. This supposition may be near the truth in most of the cases, but does not explain why the labia are found in the same position, whether the deformity of the body be slight or grave. The imperfection of the pelvis is, I believe, the chief cause of the separation of the labia.

It is necessary for me to mention the occasional existence of a small shallow cul de sac in the perineum, which Otto believes is the representative of the lower part of the vagina; it is, however, also seen in the perineum of the males, a circumstance which precludes Otto's opinion, and appears to show that, if it be the rudiment of anything, it must be of an anus.

It is a curious fact that, although the viscera are so imperfectly developed in these cases, they do not present us with any extreme instances of imperfection of the extremities. Indeed, I have not found a single instance on record in which there was the want of a few toes or fingers. The extremities, however, but more especially the lower, are invariably deformed, and in some cases may be entirely destitute of muscles, whilst the bones are perfect. The case mentioned by Breschet, and already quoted, had its right lower extremity in this state, the muscles being absent, and the limb being formed of skin, of adipose tissue, and of the bones with their ligaments.

The trunk is always more or less distorted. It inclines for the most part in the opposite direction to what it does in the simple eventrations, that is backwards, not forwards, the vertebral column being curved forwards, and as usual to one side.

Of the bones of the trunk, those of the pelvis are chiefly malformed and imperfect. The *ossa pubes* are separated from each other at the symphysis, and are greatly malformed. The ischia are generally distorted but not often imperfect. The sacrum and the coccyx also suffer with the other bones. The highest form of malformation of the pelvis we have on record, is that described by Otto, as seen in a monster in which no genito-urinary apparatus could be discovered. He says, "no pelvic cavity could be said to exist, the sacrum, the coccyx, and the three last lumbar vertebræ were absent, and the pubis and ischium were greatly deformed."

The placenta is oftentimes adherent to the sac or to the viscera, and then appears to be lobulated, a tendency to which is ob-

* Loc. cit.

served normally. One effect of the adhesion of the placenta to the eventration, is the almost total absence of an umbilical cord. The umbilical vein always runs towards the liver on one side of the eventration; the arteries are normal.

FAMILY 3d.—This family differs only from the preceding in the single circumstance of the intestinal canal being complete, which somewhat alters the appearance and arrangement of the parts. The genito-urinary apparatus is in a rudimentary condition, or at least is imperfect. If it be supposed that a monster of the preceding family had its colon extended to the anus, which was perforate; the aperture in the cæcum closed; the cloaca removed, in consequence, as it would appear, of being unnecessary; and the genito-urinary apparatus still imperfect; then an idea of the nature of a monster of this family, and of the state of its organization, will be formed.

It would be impossible to particularize the many peculiarities presented by the monsters of this family, nor is such a course expedient. The urinary organs generally present a type of structure more perfect and complete than that of any of the preceding family; but the genital organs, and more especially the internal being found in much the same state, and even altogether rudimentary. The anus is brought more forwards close to the pubes, by the traction exercised on the perineum by the eventration, and probably by the external organs of generation being absent or very rudimentary.

The trunk and extremities are in precisely the same state as in the preceding family, so that there is no need of noticing them more fully.

This family is established on some monsters described by the older authors, and on a few mentioned by Otto. The older authors have not paid much attention to the exact position, and to the degree of development of the parts involved in the eventration; hence accurate information of the arrangement of the pelvic organs in this family is still required.

FAMILY 4th.—A third division of monsters with complex eventration present the abdominal and pelvic viscera in nearly the same condition as in monsters with simple eventration, from which they differ in having the heart imperfectly developed as well as displaced.*

The second monster I have described in this paper exhibits all the more prominent features typical of a monster of this peculiar class. This will render it only necessary for me to indicate some points in which it agrees, or in which it differs from those described by others. In all, the ventricles of the

* The fissure in the parietes extending upwards into the thorax, whilst the pelvic parietes are well formed.

heart have free communication with each other at their base, where the *septum cordis* is more or less deficient. In most cases, as in my own, in that described by Steno,* in others noticed by Gurlt† and by Otto, all of which are typical of the family, the *septum cordis* is deficient above and complete below, and the aorta takes its origin from both ventricles, and consequently received the blood from both at each systole of the heart. The pulmonary artery is, of course, a branch of the aorta. In one described by Meckel,‡ which gives us one of the transition stages between this division of the complex and the simple eventration, the structure and arrangement of the parts in and about the heart were different. The *septum cordis* was complete both above and below, but had a roundish opening near its centre, through which the ventricles communicated. The aorta took its origin from the left, the pulmonary artery from the right ventricle, and there was no communication between them at this particular situation. The pulmonary artery was much larger than the aorta; so much so, indeed, that the descending aorta appeared to be a mere continuation of the former vessel. In this particular case, which is, I believe, the only one of the kind on record, the venous and arterial blood was co-mingled in the ventricles, but yet it passed to the different parts of the system through its usual channels.

This family differs from the two preceding, in the monsters composing it having the extremities, and more particularly the superior, in a very imperfect state. This character causes it to approach very closely to the simple eventrated monstrosities. The parietes of the thorax are always imperfect.

It is much to be regretted that searching examinations have not been instituted on all monsters with eventration which have the heart displaced. If this had been done, it is very likely a host of cases would have been recorded, in which the heart would have been found imperfect, and perhaps have exhibited every stage of gradation from comparative perfection to extreme imperfection.

FAMILY 5th.—I have established this genus on one solitary example, which I believe, however, is not without its parallel. It is one described by Otto, which unites all the imperfections presented by the first and third families of monsters with complex eventration, but yet cannot be classed with either of them.

In this case, the fissure in the parietes extended through the thorax, the abdomen, and the pelvis, and the whole of the

* Act. de Copenhague, obs. 109. 1671, 1672.

† Lehrbuch der Patholog. Anatom. de Haussengeth, page 133.

‡ Loc. cit. p. 21.

viscera usually contained within these cavities being displaced, the thoracic and the pelvic organs being at the same time incomplete. The colon was absent, and the cœcum opened into a cloaca, the parietes of which were formed in part by the posterior surface of the urinary bladder, which was inverted. The cloaca also received the orifices of the urinary and the genital organs. The ureters terminated at once in it. The genital organs were malformed, the external organs being absent, and the internal being divided into two distinct portions, one-half of the uterus, one Fallopian tube, and an ovary being on one side of the eventration, and a similar series of parts occupying the opposite side.

In so far, therefore, as the above characters are concerned, the monster might be considered as an example of the second family of my arrangement; but it presented, at the same time, the peculiarities of the preceding family, for it had the *septum cordis* imperfect, a free communication between the two ventricles of the heart, and the aorta arising from both of them.

The inferior extremities were shorter and slighter than usual, and were greatly deformed. The feet and hands were also imperfect, but to what extent is not stated.

Now, although I have established this family on one monster, I am of opinion that many of those which must at present be ranked amongst the examples of the second family, would, if the heart had been carefully examined, have been found to present all the characters which are necessary to constitute them examples of this family. At any rate, this monster of Otto's is an extremely interesting one in a teratological point of view, inasmuch as it unites in itself the organization of the two opposite groups of monsters with complex eventration, namely, those with the pelvic and those with the thoracic viscera incomplete.

Having enumerated the chief peculiarities and the different degrees of complexity visible in the organization of this class of monsters by defect, we are enabled to discern the close relation which subsists between the various families into which they have been separated and arranged merely for the purpose of accurate and concise description; and we are also enabled to observe that monsters with eventration constitute a distinct teratological group, the extremes of which are united by a series of gradations leading insensibly from the one to the other.

Before proceeding to discuss the much contested point of the intimate nature and mode of origin of these monsters, it will be necessary for me to advert to some circumstances not mentioned before, which are presented in common by both groups and each family.

I shall first make a few remarks regarding the sac. This

structure is always present in connection with an eventration, whether slight or grave, although it has been often overlooked or been unperceived by the observer, in consequence of having been lacerated and destroyed during labour, or of having been adherent throughout its whole extent to the displaced viscera. In both these cases, the viscera would perhaps be described, as they have often been hitherto, as naked or devoid of covering. Such statements might be made very naturally, if the observer happen to be unacquainted with the structure, or the means of detecting the existence of the sac when it is firmly adherent and inseparably united nearly throughout its whole extent to the eventrated viscera; but a previous knowledge of the subject, and a little attention and dexterity, will enable those who have opportunities of investigating and examining the anatomy of these curious aberrations of nature, to satisfy themselves of the existence of the sac, and of the exact nature of its component parts. It invariably consists of two membranes resembling each other in their general appearance and in their ultimate structure; sometimes, however, a third membrane is added to the sac, but its presence in it appears to be accidental, and is to be ascribed to the numerous adhesions which had been contracted between the layers of the peritoneum. These two membranes are occasionally distinct from each other, but are more frequently united together or to the viscera by lymph, when they may be readily distinguished and separated from one another at the margin of the fissure in the parietes, where a space equalling the whole thickness of the parietes intervenes between them.

The outer of the two membranes is the amnion still unchanged. The inner membrane is the parietal layer of the peritoneum. I mention this again and in this place, because a different analysis of the sac has been given by two talented observers, Breschet and Meckel,* who agree in referring the outer membrane to the amnion, but consider the inner to be the chorion. Breschet supposes the inner membrane, or chorion, to be lost in the *cutis vera*. Meckel, again, imagines it to be continuous with, and not the parietal layer of the peritoneum. But both these opinions are incorrect. The passage of this membrane behind the imperfect abdominal parietes, its exhibiting the usual bluish translucency of a serous membrane, and moreover its evident serous structure in all parts, at once show its exact nature, and prove it to be the parietal layer of the peritoneum.

My own observations show that the pleura will also be connected with the sac when the thoracic viscera are eventrated.

* In the works already cited. .

Monsters with eventration have other parts of the body imperfect besides the abdominal and thoracic parietes and viscera, and the extremities; thus the eventration is often associated with malformation of the vertebral column, or the cranium, or of both, many of the monsters having hemicrania or *spina bifida*. *Spina bifida* appears to occur very frequently in conjunction with complex eventration, for I find more than two-thirds of the cases I have been enabled to collect are affected with it. One-half of the remaining third are hemicephalous; so that but one-fifth of the whole are completely free from complication, if I may employ such a term. Monsters with simple eventration, on the contrary, are more frequently affected with hemicrania than *spina bifida*, though it is but seldom they present either complication.

One curious circumstance in the history of these monsters is, that the placenta is never adherent to the sac in simple eventrations, and only in one form of the complex, namely, that having the intestinal canal and genito-urinary organs imperfect,—the second family in my arrangement. Thus, in forty-eight cases of the monstrosity, thirty were examples of simple eventration, in none of which was the placenta adherent, or any morbid adhesion between the foetal membranes visible; the remaining eighteen were examples of complex eventration, in nine of which the placenta was adherent, and these nine were all malformed in the same manner, all of them having the typical characters of the first family in the complex series. It must be remarked, however, that five other examples of the same family presented essentially the same imperfections, although the placenta was non-adherent, and no traces of morbid adhesions could be detected. It is interesting to observe that the viscera were more or less adherent to the sac in ten of the thirty cases of simple eventration. These circumstances being of considerable importance when considered in connection with the question of the origin of these monsters, I deem it proper to state, that in collecting these cases I have taken into account all those cases, which, from the care taken in describing all, or at least the more particular features in the organization of the monstrosities, can be taken notice of in an inquiry of this kind; and have excluded all those which are merely mentioned as having been seen, without any description of the circumstances connected with their history accompanying the notice.

Isodore St Hilaire, in his work on monsters, states that the greater proportion of the eventrations occupy the right side; this statement, however, does not accord with my researches. In the forty-eight cases above alluded to, I was enabled to determine the position of the eventration, by the aid of the figures

or of the descriptions,—taking, in the latter case, the position of the umbilical cord, or of the umbilical vein, as a clue to the position of the eventration, where no direct mention of the side was made,—and found that no less than thirty-four inclined from the left side, whilst fourteen only, or about one-fourth of the whole number, depended from the right. The parietes of the abdomen were, therefore, malformed nearly three times as often on the left as on the right side. The preponderance of deviations of formation on the left side of the body has long since attracted the attention of anatomists, and has been connected, by Meckel, with the observation that the left half of the body is a less perfectly developed representation of the right, and that, hence, the preponderance of malformations on that side is in conformity with the law that “parts which are but the imperfect representation of parts better developed, or to produce which the formative power seems habitually to employ less energy, are also those which are formed with less constancy.”*

Another circumstance, which it is necessary I should briefly allude to, is the comparative infrequency of this form of monstrosity among the embryos of the lower animals. From the observations of Otto, Gurlt, and others, it would appear that the embryos of the ruminants, and more especially those of the sheep, are most frequently malformed in this particular manner; but their number bears but a small proportion to the human foetus. It has been remarked, and with a great degree of probability, that malformations, whether by defect or by excess, increase in frequency as we ascend in the zoological series; or, what amounts to the same, that the more perfect and more complicated the organisation of the animal, the more likely is it to present anomalies or variations in its conformation. It would appear, also, that domestication exerts some influence over the production of this as well as other malformations.

Klein† states that the larger number of these monsters present the eventrated viscera at the *os uteri* when labour commences, and that they are forced onwards through the passages with the viscera foremost. It is very probable that this statement of Klein’s may be generally correct, but it does not accord with

* Isodore St Hilaire, in making the statement that eventrations occur more frequently on the right than on the left side of the abdomen, attempts to explain the circumstance by the relation which subsists between the placenta and the liver, through the intervention of the umbilical vein. The liver, however, at the time the eventration occurs, is an almost truly median organ; but, presuming it to be lateral, it would not be difficult to show that the line of traction passing in the direction of the umbilical vein would tend to carry it to the left side.

† Deutsches Archives für Physiolog. t. iii. art. Beschreib. eines. selt. misgest. Kindes.

the history of the birth of the monsters described by Fried, Cam, Humby, and others.

The larger proportion of these monsters are still-born. Those born alive survive but for a short time after birth, the generality of them living but for a few hours.* The non-viability of monsters of this class appears to arise from many causes. The very inefficient manner in which the respiratory process is performed, and the loss of the salutary amount of pressure on the viscera, which appears so essential to the due performance of their functions, are undoubtedly the principal causes of their non-viability. The viscera, also, in the complex group present many deviations from the normal type of structure, which render them totally inadequate to carry out the processes necessary for the maintenance of life, at least for any length of time.

The deformity of the trunk and of the limbs is referrible to mechanical causes. The distortion of the limbs being principally in the manner of flexion, is mainly attributable to the permanence of their position whilst the foetus is *in utero*. The imperfection of the limbs is owing to a deficiency in the formative energy in the embryo, and is independent of any influence which may be presumed to be exercised over them by the eventration, as instanced by the thoracic extremities being sometimes malformed and greatly imperfect, or even polydigital, when the eventration is purely abdominal, and by the fact that the extremity opposite to the eventration is occasionally more malformed than that corresponding to it.

The viscera that are imperfect exhibit a persistence of one of their transitory types of structure. It is unnecessary for me to enter into detail on this subject, but I may merely mention that the fact of such malformation, depending on the permanency of a foetal type of structure, and not on the substitution of an entirely new type, was first pointed out by the illustrious Harvey, and has since his time been imbued with a truly scientific character by the labours of Haller, Wolff, Meckel, and others.

(The reader will find a parallel drawn between the cloaca of birds and the cloaca of the second family of monsters, by Geoff. St Hilaire, in the Dictionnaire d'Histoire Naturelle, tome viii. article Intestins.)

In inquiring into the cause of the malformation, it is needless for me to enter into detail on the many vague and ingenious opinions, such as the imagination of the mother, the agency of supernatural beings, seeing frightful objects, and the like, which have been advanced from time to time in order to ex-

* Mercklin mentions a monster which lived eleven days after birth, and Otto one which lived several days. The former case is not sufficiently well authenticated; the latter appears, from the indefinite statement, to be equally uncertain.

plain the origin of this as well as other malformations of the foetus, and which, although considered sufficient to remove all difficulties at the time when they were severally resorted to, have been swept away before the enlightened views acquired from the rapid advance of embryology.

The malformation originates in an arrest of development of the anterior parietes of the trunk; that arrest of development being in strict accordance with the general rule applicable to malformations by defect collectively; namely, that those parts of the organism which are latest in arriving at perfection are those which are most liable to deviate from the normal structure. At an early period, the embryo has the whole or the greater part of the rudimentary viscera contained within the umbilical vesicle and the embryonic expansion of the amnion continuous with the sheath of the umbilical cord; and it is not until near the termination of the third month that the parietes become so completely formed as to enclose the viscera within them. Before the third month, therefore, there is, in some measure, a natural eventration. The persistence of this natural eventration,—of the embryonic type of the parietes of the trunk, and the original position of the viscera,—with such modifications as are necessarily induced by changes in the relative position of other parts of the body, and by circumstances already fully alluded to, constitutes in the foetus a vicious conformation, which is then known as a monster with eventration. All teratologists of the present day are agreed in referring the origin of the malformation to an arrest of development, but are at variance with regard to the primary cause of the arrest of development; some believing that it arises from a vicious condition of the ovum from the period of conception, while others entertain the opinion that it proceeds from some accidental cause supervening during the earlier stages of development.

The most generally received doctrine * of the present day is that which originated in the philosophic mind of Geoffroy St Hilaire, and has since his time been supported by a great number of those who have directed their attention to the subject. The doctrine holds that this peculiar malformation arises, in common with many others similar to it, during some part of the first three months of embryonic life, in consequence of the am-

* Other doctrines have been advanced with a much less degree of plausibility, which I may mention. Thus it has been presumed that it, the defective development, arises from an increased size of the liver; or again, from the want of development in those vessels which normally unite in the median line. The former of these opinions is at once refuted by the fact that the liver is not ordinarily increased in size, but, on the contrary, is smaller than usual. The latter, which is supported by Tiedemann, (*Anatomie der kopflosen missgebüten*, p. 105), is contrary to the known laws of development, whereby it is proved that the rudiments of parts are formed before their vessels, and that both always bear a constant relation to one another.

niotic surface of the placenta becoming morbidly connected by adhesive inflammation to the amniotic investment of the vitaline duct, whereby the viscera and their envelopes are retained in their primitive position. This morbid connection between the placenta and the embryo is supposed to act in two ways in causing the malformation ; *first*, mechanically, the adhesions keeping up a continual strain on the parts of the embryo to which they are fixed ; *secondly*, pathologically, the morbid action inducing some change in the structures attacked by it, which prevents or impedes the normal development of the parts ; the former inducing more especially that part of the malformation which is dependent on displacement, the latter giving rise to the arrest of development.*

The evidence in support of this doctrine is adduced from two sources ; from experiment, and from analogical observations, both of which will require somewhat extended consideration, that we might be enabled to determine the true nature of the evidence and appreciate its value.

Eggs were placed, during incubation, in unnatural positions, and the shells were coated in different places with varnish or wax, by Geoffroy St Hilaire,† for the express purpose of procuring positive and direct proofs of the validity of the theory of the accidental origin of malformations by defect generally, from an appeal to experiment. The results that were obtained by him showed that adhesions between various parts of the embryo and its membranes, and even the mode of development of the embryo itself, might be affected at the will of the experimenter, by resorting to the method he employed. Amongst the more successful of his experiments is to be ranked that by which he caused the production of an embryo chick, presenting, according to him, the appearances of a simple eventrated monster. In this particular case, the abdominal viscera were displaced without the abdominal cavity, and had dragged down the heart, which was visible externally, although the greater part of it still remained within the thorax. The viscera themselves presented no peculiarity ; but the sternum, according to St Hilaire, did not extend downwards as far as it does ordinarily.

These experiments were repeated by his son, Isod. G. St Hilaire, who has given a detailed account of them in his work

* For a full exposition of the conditions of this theory, and the evidence by which it is supported, the reader is referred to the original memoirs of Geoff. St Hilaire in the Philosophie Anatomique, Vol. ii. and iii., and in the Memoires du Museum, Vol. xii. ; to the work on monsters by Isodore St Hilaire ; and to Dr Simpson's Observations on the Inflammatory Origin of some Varieties of Hernia and Malformation in the fœtus in the Edinburgh Medical and Surgical Journal for 1839.

† A full account of these experiments will be found in the Mem. du Mus.

on monsters.* As they bear directly on this subject, and, moreover, illustrate the power of resisting mutilation possessed by the embryo, I shall give them at full length. Besides placing the eggs on end during incubation he pursued the following plan. The egg was shaken slightly in the direction of, or perpendicular to, its axis; the shell was covered with varnish, destined to destroy or diminish its porosity; a part of it was thinned at the apex by the application of a dilute acid; another part was removed with a needle or scalpel, and immediately replaced by a very porous substance, the nature of which is not mentioned; and then a superficial or a deep perforation was made by means of a brass, steel, or gold needle, which was either immediately withdrawn or maintained in its place with certain precautions. Proceeding in this way he obtained the following results. The succession of the eggs alone did not produce any very great modification in the development of the embryo; for, contrary to what the experimenter had expected, the chicks were living and exempt from all malformation, but manifestly retarded in their evolution on the twenty-second day after the experiment was performed. In two eggs examined on the twenty-fourth day, he found the chicks well formed in all respects, but presenting a general and very marked arrest of development; they were seemingly dwarfs. One had ceased to live apparently for some days; the death and imperfect development of this embryo had been caused by a portion of a very fine needle which had been allowed to remain within the egg, and was afterwards discovered between the embryo and the shell. An egg, the shell of which had been slightly thinned at the two extremities by the application of a few drops of dilute nitric acid, on being opened, was found only half filled by the embryo, one portion of the vessels of which were black, obliterated, and apparently gangrenous. All the other eggs on which he experimented presented nothing in particular. Many of those into which brass pins had been introduced presented the same appearances as those of an unimpregnated egg; others were in a state of putrefaction. Those into which steel or gold pins had been introduced presented various modifications of the albumen and yolk, which, having no connection with the subject under consideration, need not be noticed.

The only marked effect produced by the experiments of the two St Hilaires, with the exception of the total annihilation of the embryo, is a general defect in the formative energy by which the embryos were not malformed, but merely prevented from attaining their usual size. Indeed, if we also except the chick

* Vol. iii. page 503, *et seq.*

with an apparent eventration seen by the elder St Hilaire, no decided results have been obtained from the many attempts that have been made from time to time to induce malformations by defect, by acting mechanically on the eggs during development. Even the appearances presented by the chick before alluded to are very dissimilar from those which characterize a true eventration ; thus, there was no malformation of the viscera, no distortion of the trunk, and no imperfection or deformity of any part of the body but the abdominal parietes. Reviewing the facts before us, we cannot help arriving at the conclusion that the experiments hitherto performed are undecisive, and in no way applicable to the explanation of the primary cause of monstrosities with eventration. Isidore St Hilaire allows that the results obtained, both by himself and his father, are negative, and cannot be held to conform with the conditions of the mechanical theory as applicable to this and other forms of malformation by defect.*

Observation shows that the malformation and adhesions between the abdomen and the placenta are occasionally associated, but does not appear to have proven that the former is a consequence of the latter. It is true some forms of malformation by defect, and others by displacement, have been shown by different observers to be referrible in the first instance to morbid adhesions contracted between the foetus and the placenta, or between one part of the foetus and another. Amongst such might be mentioned the imperfect development of the limbs, (so called spontaneous amputation), occasionally met with in the human foetus, which have been proved by the observations of Drs Montgomery and Simpson to be the consequence of the mechanical action of bands or rings of lymph effused during development ; and congenital hernia, more especially congenital inguinal hernia, which, according to the researches of Dr Simpson, is occasionally the result of morbid adhesions contracted between the intestine and the testis, whilst the latter is an abdominal organ.† These and other observations of a similar nature indicate that where the placenta is attached to the abdomen of the embryo, or where the viscera or peritonæum are more or less adherent to the amnion, the eventration may be primarily induced by accidental causes, that the parietes and the viscera may have attained to a certain degree of development, and the subsequent changes which take place in them

* And Dr Thomson, who has repeated the experiments, informs me that although the results show that the fetus is under the influence of mechanical causes, yet the malformations induced by such experiments differ widely from the well-known malformations which come under the notice of the teratologist.

† Edin. Medical and Surgical Journal, Vol. iii. p. 17, *et seq.*

before they arrive at perfection, have been arrested by a mechanical or a pathological cause.

I have already pointed out the comparative infrequency of placental adhesions in this group of monsters, scarcely one-fifth of the whole number of authentic cases presenting that peculiarity; and I have alluded to the curious circumstance that such adhesions appear to be always associated with one particular form of the malformation and not with all. Now, without acquiescing in the opinion advanced by Dr Simpson,* one of the most zealous supporters of the mechanical theory, that all kinds of the malformation are referrible to morbid adhesions of the embryo to the placenta or membranes of the ovum for their cause, although such adhesions might be non-visible afterwards in consequence of having been ruptured during the process of parturition, or during the course of intra-uterine life, or in a still less feasible supposition of Geoffroy St Hilaire's,† that where placental adhesions are not found, the malformation is owing to an hypothetical adhesion of the allantois to the amnion, both of which opinions are unsupported by facts. I am inclined to admit that the malformation in the first family of the complex group may probably be sometimes caused by the adhesion of the embryo to the placenta; and moreover, that some of the monsters with simple eventration may have their origin in morbid adhesion of the peritonæum or some of the viscera to the amnion, although the supporters of the mechanical theory have not yet claimed them as their own. At any rate, until we are enabled to show, by repeated and accurate observation, how much of these morbid connections is the result of some pathological action induced by the eventration itself, we must deliver over those cases, which amount to little more than one-third of the whole, to the supporters of the mechanical theory.

In conducting inquiries of this kind, sufficient attention, as it appears to me, has not been hitherto paid to the question, whether adhesions of the viscera to the amnion, or of the placenta to the embryo, are not the effect rather than the cause of the malformation. The circumstance of the adhesions of the placenta to the embryo being "seen" in one family only, and of others of the same family being constructed in essentially the same manner without the slightest trace of adhesion of any kind being visible, goes far to prove that the position of the eventration may, in some cases, induce inflammatory action, and thus may be accidentally united to the placenta. The highest form of the malformation that has yet been observed,—that which

* Edin. Med. and Surg. Journ. Vol. xlv. p. 308.

† Mem. du Museum, Vol. xii. page 247, *et seq.*

is described by Otto, and is constituted into the fifth family in my arrangement,—as well as others of a different kind, have been most undoubtedly caused without any adhesion between the embryo and placenta, or viscera and amnion, or any appreciable mechanical or pathological cause, and must be referred to some original unnatural conformation or condition of the ovum for their production. Hence, why may not the others have originated in a similar condition of the ovum, the pathological action and its consequences arising as a result of the malformation, and being dependent for its origin on some circumstances, the exact nature of which has not yet been ascertained? This question requires either an affirmative or a negative reply before it will be possible for the teratologist to arrive at any satisfactory general conclusion respecting the more immediate cause of the malformation.

The primary cause of the malformation, therefore, remains an open question, requiring much further investigation before it can be satisfactorily resolved. Still, the evidence derived from the history and organization of the monsters themselves, which seems to lead to the almost certain conclusion that the malformation originates in a primitive unnatural condition of the ovum, although what that condition of the ovum is, or what its cause may be, remains a problem, must not pass unnoticed. To enter fully into all the circumstances that may be adduced in favour of the view, that monsters with eventration are of original formation, would amplify the already too extended limits of this paper, I shall therefore simply enumerate the facts which appear to be the most convincing.

1°. The whole group of monsters with eventration form collectively a complete series, the extremes of which are united by intermediate forms. This series is not composed of an infinite series of forms; on the contrary, it is limited to a few, which are constantly recurring. Again, the structure of these monsters is not extremely varied, but defined, and admits of their being arranged according to the principles usually employed in making a natural classification. Most of the monsters in this arrangement are observed to be typical of the family to which they severally belong, whilst those which deviate from the typical form serve to unite neighbouring families, and complete, to a great extent, the circle by which the most simple and the most complicated examples of the malformation are connected.

2°. The malformation of the parietes in all, and of the viscera in the complex group, is in strict conformity with a general law, which, although differing in the terms used in expressing it, is identically the same as that which regulates the frequent in-

clination of the eventration to the left side, the energy employed by nature in forming these parts being, for the most part, visibly backward and tardy.

3°. Moreover, although monsters with eventration, and more especially those which present the most marked defect in the development of the viscera, are usually otherwise greatly malformed by defect, as, for instance, in the cranial and spinal parietes, and in the extremities, yet they often present, in conjunction with these malformations by defect, others by redundancy, and that even in those cases where the placenta is adherent to the embryo, or the viscera are attached to the embryonic portion of the amnion. The supernumerary *appendix vermiciformis*, and the enlarged *lobus Spigelii* of the liver are here more particularly alluded to.*

These circumstances, taken either singly or collectively, tend to preclude the idea that accidental causes can possibly have led to the production of such a complete teratological family, however varied these accidental causes may be presumed to be in their nature and mode of duration.†

As already stated, the mode of origin of these malformations still remains a problem to be solved only by much patient and accurate observation. Seeing the impossibility of arriving at any satisfactory conclusion on the point in question, I have purposely refrained from arguing it to any extent, and have confined myself principally to the simple statement of the facts and arguments which may be adduced in support of either of the views entertained by teratologists at the present time. In connection with this, I would remark, that, although thoroughly convinced of the primitive origin of the greater number of the monsters of this class, I am far from supposing that all of them originate in an unnatural condition of the ovum; on the contrary, I am inclined to admit that accidental causes, and more especially adhesive inflammation, may induce an arrest of development in the parts influenced more directly by it, after those parts have been evolved to a certain extent; that a complex eventration may result from the embryo being morbidly connected to the placenta, and a simple eventration from the viscera or the peritoneum being adherent to the embryonic portion of the amnion. The facts already acquired concerning the organization and pathological phenomena presented by

* This last circumstance at once refutes the accidental theory, since it is impossible to reconcile it with the existence of defective development, where a mechanical cause is the only agent in inducing both at one and the same time, and in a part of the same system.

† The reader is referred to Meckel's *Historia Monstrorum Nonnullorum*; a work written expressly for the purpose of refuting the mechanical theory as advanced by St Hilaire, for a complete account of the evidence in favour of the primitive origin of malformations by defect.

these monsters, which facts I have attempted to arrange in a systematic form in this necessarily imperfect notice, may probably assist those who take up the subject hereafter in their researches, and may tend to lead to the determination of the much disputed question.

March 1847.

Description of the Plates.

PLATE XII.

The eventration is seen depending from the left side of the abdomen. The sac having been removed.

1. The body of the liver.
2. The enlarged *lobus Spigelii*, projecting forwards from the liver, between
3. The stomach, which is seen slightly raised from the abnormal position described in the text, and
4. The pancreas, the splenic extremity of which is found broader than the duodenal.
5. The intestine*, the puckered appearance of which is well delineated.
6. The left kidney.
7. The spleen, having a somewhat lobulated appearance.
8. The penis; the prepuce being somewhat enlarged.
9. The gall-bladder, in its collapsed state.

I must apologise for this imperfect figure of the anatomy of this monster. Several drawings were made of different dissections of the parts, but were unfortunately lost.

PLATE XIII.

1. The liver.
2. The *lobus Spigelii*, somewhat enlarged, and detached from the liver.
3. The stomach, placed below the *lobus Spigelii*, in order to show that lobe.
4. A small portion of the pancreas.
5. The small intestine, even more puckered than in the preceding monster.
6. The left kidney.
7. The spleen.
8. The oval depression, indicating the position of the glenoid cavity.

PLATE XIV.

Fig. 1. Structure of the external membrane of the sac, which exhibits the epithelium (*a*), the germinal membrane, with the germinal spots arranged in parallel rows (*b*), and the areolar texture (*c*), characteristic of a serous membrane.

Fig. 2. Exhibits the heart and larger blood-vessels taken from the second monster described in the text.

1. The incomplete ventricular septum, the ventricles communicating freely over its semilunar border.
2. The sinus, or *bulbus arteriosus*. The three semilunar valves with which it is provided are figured.
- * 3. The pulmonary artery arising from it and immediately dividing into its two branches. The aorta is the main continuation of the bulb.
4. The lung.

Fig. 3. Exhibits the arrangement of the bones in the right arm of the same monster.

1. The scapula articulating with the single bone.
2. Which represents the ulna, radius, and humerus.
3. The cartilaginous nodule representing the carpus.
4. A metacarpal bone.
5. The three phalanges.



